

## RADIO TEST REPORT ETSI EN 300 220-1 V2.4.1(2012-05) ETSI EN 300 220-2 V2.4.1(2012-05)

Product: Ajax MotionProtect

Trade Name: ハノハ×

Model Name: Ajax MotionProtect

Serial Model: N/A

Report No.: NTEK-2016NT05246035R

#### Prepared for

Ajax Systems Inc.

910 Foulk Rd., Wilmington, DE 19803, United States

#### Prepared by

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#### TEST RESULT CERTIFICATION

Report No.: NTEK-2016NT05246035R

Applicant's name ...... Ajax Systems Inc

Manufacture's Name.....: "Research and Production Enterprise "Ajax"LLC

Address ...... 5, Sklyarenko, Kyiv04073, Ukraine.

**Product description** 

Product name ...... Ajax MotionProtect

Model and/or type reference : Ajax MotionProtect

Serial Model: N/A

Rating(s) ...... DC 3.0V

Standards ..... EN 300 220-1 V2.4.1: 2012-05

EN 300 220-2 V2.4.1: 2012-05

This device described above has been tested by Shenzhen NTEK, and the test results show that the equipment under test (EUT) is in compliance with the of article 3.2 of the Directive 1999/5/EC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test

Date of Issue 15 June 2016

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APPENDIX-PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS



## 1. Summary Of Test Results

Test procedures according to the technical standards: ETSI EN 300 220-1 V2.4.1 (2012-05)

ETSI EN 300 220-2 V2.4.1 (2012-05)

Clause	Description of Test Item	Results(Pass/Fail)	N.T(Not Test)
25	Transmitter Parar	meters	2 2 .
7.1	Frequency error and frequency drift	* * *	₩.T.
7.2	Average power	Pass	30 30
7.3	Effective radiated power	4 4 4	LN.T
7.4	Spread spectrum modulation		N.T
7.5	Transient power	Pass	7 7
7.6	Adjacent channel power	0 0	N.T
7.7	Modulation bandwidth	Pass	5 5
7.8	spurious emissions	Pass	4
7.9	Frequency stability under low-voltage conditions	Pass	4 4
7.10	Duty cycle		N.T
7.11	Time-out-timer	4 4 4	N.T
	Receiver Param	eters	4
8.1	Receiver sensitivity	4 4 4	N.T
8.2	Receiver LBT threshold	* * *	→ N.T →
8.3	Adjacent channel selectivity	37 37 37	N.T
8.4	Blocking	Pass	* *
8.5	Spurious response rejection	10 10 10	N.T
8.6	Receiver spurious radiation	Pass	
(1)		(1) (1) (1)	



1.1 Test Facility

NTEK Testing Technology Co., Ltd.

Add.: 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District,

Report No.: NTEK-2016NT05246035R

Shenzhen P.R. China

FCC Registered No.: 791972 IC Registered No.:9270A-1

CNAS Registration No.:L5516

1.2 Measurement Uncertainty

The reported uncertainty of measurement  $\mathbf{y} \pm \mathbf{U}$ , where expended uncertainty  $\mathbf{U}$  is based on a standard uncertainty multiplied by a coverage factor of  $\mathbf{k=2}$ , providing a level of confidence of approximately  $\mathbf{95}$ %.

No.	Item.	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5.	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

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2. General Information

#### 2.1 General Description Of EUT

Equipment	Ajax MotionProtect						
Brand Name	NIXX t t t t t						
Model Name.	Ajax MotionProtect						
Serial Model	N/A						
Model Difference	N/A						
	The EUT is Ajax Motion	Protect					
	Operation Frequency:	868 MHz – 868.5MHz;					
	Channel number	3 Channels					
	Modulation Type:	FM & & A					
	Antenna Gain(Peak)	-7dBi					
Product Description	Antenna Designation:	Built-in helical antenna					
	Power Rating	DC 3.0V					
	in User's Manual, the EU	More details of EUT technical					
Channel List	Refer to below						
Adapter	N/A						
Battery	DC 3.0V						
Hardware Version (wireless module)	N/A	at at at a					
Hardware Version	N/A	4 4 4 4					
Software Version	N/A						

#### Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2

Channel	Frequency
Clianie	(MHz)
00	868.1
01	868.3
A 02 A A	868.5



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#### 2.2 Description Of Test Conditions

1.Block diagram of transmitter

E-1 Eut

#### 2.2.1 Test Conditions and Channel

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-10°C ~ 40°C Note: (1)
Relative Humidity	20% - 75%	N/A
Supply Voltage	AC 230V	AC 207-253V
Supply Voltage	DC 3.0V	DC 2.9-3.5V

#### Note:

- (1) For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in clause 5.4.1.2, at the upper and lower temperatures of the range as follow: temperature: -10°C to +40°C;
- (2) For the Leclanché or lithium type battery: 0.85 times the nominal voltage of the battery; for the mercury or nickel-cadmium type of battery: 0.9 times the nominal voltage of the battery. In both cases, the upper extreme test voltage shall be 1.15 times the nominal voltage of the battery.
- (3) The measurements are performed at the highest, middle, lowest available channels.



#### 2.3 Description Of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Ajax MotionProtect	XVIV	Ajax MotionProtect	N/A	EUT
+	* * *	* *	* * *	* * *	大
				21 21 2	
+	* * *	* *	* * *	* * *	*
			31 31 31 31 X	3" 3" 3	
+	* * *	` * *	* * * *	***	*

	Item	Shielded Type	Ferrite Core	Length	Note	
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2	+	* * *	4 4	at at at	* * * *	
	+	* * *	* *	* * *	* * * *	

#### Note:

- (1)
- The support equipment was authorized by Declaration of Confirmation. For detachable type I/O cable should be specified the length in cm in <code>FLength</code> column. (2)



ect

#### 2.4 Equipments List For All Test Items

				. //		(1)	
Item	Kind of Equipment	Manufactur er	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
7	Spectrum Analyzer	Agilent	E4407B	160400005	2015.07.06	2016.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2015.07.06	2016.07.05	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2015.07.06	2016.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.07.06	2016.07.05	1 year
5	Spectrum Analyzer	ADVANTES T	R3132	150900201	2015.07.06	2016.07.05	1 year
6	Horn Antenna	EM	EM-AH-20 180	2011071402	2015.07.06	2016.07.05	1 year
_7	Horn Ant	Schwarzbec k	BBHA 9170	9170-181	2015.07.06	2016.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2015.07.06	2016.07.05	1 year
9	Loop Antenna	ARA	PLA-2030/ B	1029	2015.07.06	2016.07.05	1 year
10	Power Meter	R&S	NRVS	100696	2015.07.06	2016.07.05	1 year
11	Signal Generator	R&S	SMT 06	832080/007	2015.07.06	2016.07.05	1 year
12	Temperatur e & Humitidy Chamber	GIANT FORCE	GTH-056P	GF-94454-1	2015.07.06	2016.07.05	1 year
13	Power Sensor	R&S	URV5-Z4	0395.1619.05	2015.07.06	2016.07.05	1 year



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#### 3. Frequency error and frequency drift

#### 3.1 Applied procedures / limit

The frequency error and drift shall not exceed the values given in table 1 or 2 under normal and extreme conditions.

Table 1: Frequency error for systems with channel spacings of less than or equal to 25 kHz

	Frequency error limit (kHz)					
Channelization	47 MHz	47 MHz to 137 MHz	137 MHz to 300 MHz	300 MHz to 500 MHz	500 MHz to 1000 MHz	
Channelized systems	±10	±10	±10	±12	±12.5	

Note: For equipment having a channel spacing of 12,5 kHz or less, the frequency error limit shall not exceed 50 % of the channel spacing.50 % of the channel spacing.

Table 2: Frequency error for all other systems

	Op	perating frequency	У		Freque	ency erro	or limit (pp	m),seer	note
3.0	3,0	≤ 1 000 MHz	3.0	3.0	3.01	30	±100	3.0	3.0

NOTE: The frequency error measured shall not exceed the designated frequency band.

#### 3.2 Measuring Instruments and Setting

The following table is the setting of Spectrum Analyzer.

Spectrum Analyzer	Setting
Attenuation	10~20dB
Span Frequency	500kHz
RB	10 kHz
VB	30 kHz
Detector	Peak
Trace	Peak 50 sweeps



#### 3.3 Test Procedures

- a)Connected the antenna port to the Spectrum Analyzer via a Attenuator,
- b)Set center frequency of spectrum analyzer = operating carrier frequency.

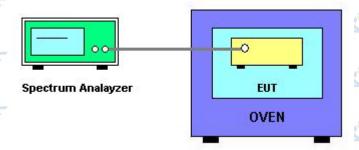
set the Spectrum Analyzer as below:

Resolution BW: 10 kHz Video BW: 30 kHz Span: 500 kHz

c)When the trace completed, find the peak value of the power envelope and record the frequency.

The above procedure shall be performed at normal and extreme test conditions.d. The measurement shall be repeated at the lowest, the middle, and the highest channel of the stated frequency range. These measurements shall also be performed at normal and extreme test conditions.

#### 3.4 Test Setup Layout



#### 3.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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#### 3.6 TEST RESULTS

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EUT:	Ajax MotionProtect	Model Name :	Ajax MotionProtect	
Temperature :	26°C	Relative Humidity		
Pressure :	1012 hPa	Test Voltage :	N/A	1
Test Mode :	N/A	+ + +	+ * * *	
				4
Note: the equipn	nent is not capable of produc	cing an unmodulated cari	rier.	
				.4
4 4	4 4 4	4 4 4	7 7 7	7
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			2 2 2	3
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" Z" Z		Ziv Ziv Ziv	Si Si Si	3
* *	* * * *	- 1 1 1		-
47 147 1		10 10 10		
4 4	4 4 4	4 4 4	4 4 4	7
A . A .	to to to	. Ot . Ot . O		
	4 4 4	4 4 4	2 2 2	2
ot ot .	* * * *	* * * *	+ * * *	*
4 14 1		The the the		2
4 4	444	4 4 4	4 4 4	4
of of		. O . O		
	2 2 2	2 2 2	2 2 2	2
			1 1 1 1	_

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### 4. Average power (conducted)

#### 4.1 Limits

Under normal and extreme test conditions, the average output power (conducted) shall be less than or equal to the value given in table 3 for the respective frequency band, application, and channel spacing.

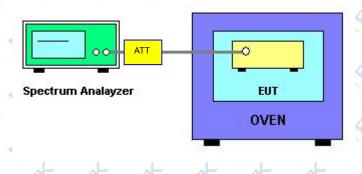
Table 3

	Table		
Frequency Bands	Maximum radiated power, e.r.p. / power spectral density	Channel spacing	Spectrum access and mitigation requirement (e.g. Duty cycle or LBT + AFA)
863,000 MHz ~ 870,000 MHz	25 mW Power density is limited to -4,5 dBm/100 kHz	No requirement	0,1 % or LBT +
868,000 MHz ~868,600 MHz	25 mW	No requirement	1 % or LBT + AFA
869,400 MHz ~869,650 MHz	500 mW	\$25 kHz The whole stated frequency band may be used as 1 wideband channel for high speed data transmission	10 % or LBT + AFA

#### 4.2 Measuring Instruments and Setting

Spectrum Analyzer	Setting
Attenuation	Auto W W W
Center Frequency	The frequency which is transmitting
Detector	Average
Sweep Time	Auto
RBW	100 kHz
VBW	≧RBW

#### 4.3 Test setup





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# 4.4 EUT Operation during Test The EUT was programmed to be in continuously transmitting mode.

#### 4.5 TEST RESULTS

EUT:	Ajax MotionProtect	Model Name :	Ajax MotionProtect
Temperature :	26°C	Relative Humidity:	60 %
Pressure :	1012 hPa	Test Voltage :	DC 3.0V(NORMAL)
Test Mode :	TX CH00	3 3	2 2 2 2

#### 868MHz~868.6MHz

2 2	TEST CC	NDITIONS	2 2		3	Total e	e.i.r.p ( dl	Bm)	
	1231 00	MOTHONS		1	CH00				
T nom (°C)	20.00	V nom (V)	3.0		9.74	1100			1
T min (°C)	-10.00	V max (V)	3.5	.1	9.7	4	4	7	4
1 111111 (-C)	-10.00	V min (V)	2.9		9.73	11/07	11.07	1	
T max (°C)	40.00	V max (V)	3.5		9.69	7	4	4	5
Tillax (C)	40.00	V min (V)	2.9		9.63		3:07	NO.	
	Max R	F Power	4 4	4	704	704	9.74	4	7
4 4	Li	mits	21 2		4	20dB	m (-10dE	BW)	2
+ 4	Re	sult	A.	4	4	C	omplies	A.	4





#### 5. Effective radiated power

#### 5.1 Applied procedures / limit

The effective radiated power shall not exceed the values 25mW

#### 5.2 Measuring Instruments and Setting

The following table is the setting of the power meter.

		3						_
	Spectrum Analyzer	Setting						
١.	Attenuation	Auto	3	3	3	3	3	à
1	Start Frequency	25 MHz						
<b>*</b>	Stop Frequency	1000 MHz						٦
	Detector	Positive Peak	1					Φ.
4	Sweep Time	Auto						
15	RB / VB	100 kHz/100 kHz				4		

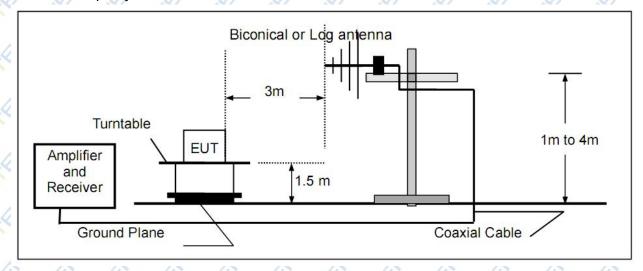
#### 5.3 Test Procedures

EUT was placed on a 1.5m outdoor wooden table. The search antenna is placed at 3m distances from the EUT and search antenna height is from 1-4m. With the transmitter operating at continuously mode, the turntable was slowly rotated to locate the direction of maximum emission. Once maximum direction is determined, the search antenna was raised and lowered in both vertical and horizontal polarizations.

The EUT was removed from the turntable and replaced with a linearly polarized antenna connected to a calibrated RF signal generator. The RF generator was set to a measured emission frequency and the search antenna was raised and lowered to produced a maximum received reading. The generator output was increased to match the radiated emission reading measured previously, and the result expressed in dB E.I.R.P. or ERP.



#### 5.4 Test Setup Layout



#### 5.5 EUT Operation during Test

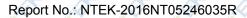
The EUT was programmed to be in continuously transmitting mode.





#### 5.6 TEST RESULTS

5.6 TEST RES		t at at at	- let let let
EUT : Temperature :	Ajax MotionProtect 26°C	Model Name : Relative Humidity	Ajax MotionProtect
Pressure :	1012 hPa	Test Voltage :	60 % N/A
Test Mode :	N/A	H 14 14 14	- 4 4 4
4 14 5			
			A PO PO
4 4	7 7 7	<del></del>	7 7 7 7
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OF ST			
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#### 6. Frequency stability under low voltage conditions

#### 6.1 Applied procedures / limit

This test is for battery operated equipment only.

The equipment shall either:

- a) remain on channel, for channelized equipment within the limits stated in clause 5.1.1, or within the assigned operating frequency band, for non-channelized equipment, whilst the radiated or conducted power is greater than the spurious emission limits; or
- b) the equipment cease to function below the providers declared operating voltage.

#### 6.2 Measuring Instruments and Setting

The following table is the setting of Spectrum Analyzer.

Spectrum Analyzer	Setting				
Attenuation	10~20dB				
Span Frequency	500kHz				
RB	10 kHz	3			-
VB	30 kHz				
Detector	Peak				
Trace	Peak 50 sweeps				4



#### 6.3 Test Procedures

- a)Connected the antenna port to the Spectrum Analyzer via a Attenuator,
- b)Set center frequency of spectrum analyzer = operating carrier frequency.

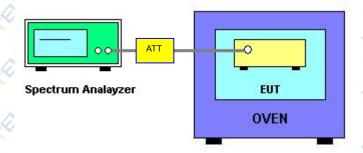
set the Spectrum Analyzer as below:

Resolution BW: 10 kHz Video BW: 30 kHz Span: 500 kHz

c)When the trace completed, find the peak value of the power envelope and record the frequency.

The above procedure shall be performed at normal and extreme test conditions.d. The measurement shall be repeated at the lowest, the middle, and the highest channel of the stated frequency range. These measurements shall also be performed at normal and extreme test conditions.

#### 6.4Test Setup Layout



#### 6.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



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#### 6.6 TEST RESULTS

4	6.6 TEST RESUL	rs at the	7 7	et and	A COL	A. Cart	A COL	A A
4 4	EUT:	Ajax MotionProtec	t	Model Name	:	Ajax Mot	ionProte	ect
.0	Temperature :	26 °C		Relative Hun	nidity:	60 %		.07
4 4	Pressure :	1012 hPa	7, 7,	Test Voltage	:	DC 3.0V	4	4 4
*	Test Mode :	TX CH1	*	* *	*	*	*	*
		310 310	41° 41		7.0	Ziv.	2110	21º 2
et	AC power	Conducted			Limits			

- 11		1012 hPa	lest Voltage : DC 3.0V
2	Test Mode :	TX CH1	
-	411 411	7, 7,	\$\frac{1}{2}\frac{1}\frac{1}{2}\f
	AC power Supplied (V) AC	Conducted Power	Limits
	3.0V	5.11dBm	a) Remain on channel, for channelized equipment within the limits stated in clause 7.1.3, or within the assigned operating
	3.5V	2.16dBm	frequency band, for non-channelized equipment, whilst the
4	2.9V	0.50dBm	radiated or conducted power is greater than the spurious emission limits; or
4	€1.6	No function	b) The equipment cease to function below the providers declared operating voltage.
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	4 4	41 41	4, 4, 4, 4, 4, 4, 4, 4, 4, 4
	*	30 30	
	A- A- A-	- A- A-	



#### 7. Spurious emissions - Transmitter (25- 1000MHz)

#### 7.1 Applied procedures / limit

State	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies ≤ 1 000 MHz	Frequencies > 1 000 MHz	
Operating	4 nW /-54dBm	250 nW/-36dBm	1 μW /-30dBm	
Standby	2 nW /-57dBm	2 nW /-57dBm	20 nW /-47dBm	

#### 7.2 Measuring Instruments and Setting

The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	25 MHz
Stop Frequency	1000 MHz
Detector	Positive Peak
Sweep Time	Auto at at at at at
RB / VB	100 kHz/100 kHz

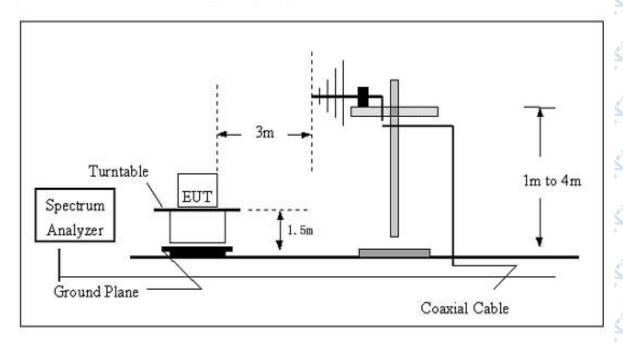
#### 7.3 Test Procedures

- a. The EUT was placed on the top of the turntable in open test site area.
- b. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- c. This measurement shall be repeated with the transmitter in standby mode where applicable.
- d. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
- e. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
- f. Replace the EUT by standard antenna and feed the RF port by signal generator.
- g. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
- h. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
- i. The level of the spurious emission is the power level of (8) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
- j. If the level calculated in (9) is higher than limit by more than 6dB, then lower the RBW of the spectrum analyzer to 30KHz. If the level of this emission does not change by more than 2dB, then it is taken as narrowband emission, otherwise, wideband emission.
- k. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.



#### 7.4 Test Setup Layout

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz

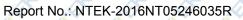


#### 7.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 7.6 Results of Standby Mode Spurious Emissions

For the initial investigation on standby mode and receiving mode, no significant differences in spurious emissions were observed between these 2 modes. So test data for standby mode was omitted in this section.





#### 7.7 TEST RESULTS (25MHz ~ 1000MHz)

EUT:	Ajax MotionProtect	Model Name :	Ajax MotionProtect
Temperature :	24 °C	Relative Humidity:	54%
Pressure :	1010 hPa	Test Power :	DC 3.0V
Test Mode :	TX At At	* * *	* * *

Polar	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(H/V)	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	Туре
V	38.91	60.44	18.95	-75.13	-36.00	-39.13	peak
V	178.00	40.31	12.51	-81.78	-36.00	-45.78	peak
V	677.70	58.54	20.87	-71.50	-54.00	-17.50	peak
V	907.36	39.39	24.09	-64.87	-36.00	-28.87	peak
H	37.63	58.51	19.42	-74.71	-36.00	-38.71	peak
H	154.10	35.61	-5.17	-82.17	-36.00	-46.17	peak
Н	414.72	62.26	-10.82	-78.69	-36.00	-42.69	peak
H	38.97	44.51	-10.82	-76.13	-36.00	-40.13	peak

#### Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



### 8. Spurious emissions – Transmitter (Above 1000MHZ)

#### 8.1 Applied procedures / limit

	47 MHz to 74 MHz		
Stata	87.5 MHz to 118 MHz	Other frequencies	Frequencies
State	174 MHz to 230 MHz	≤ 1 000 MHz	> 1 000 MHz
	470 MHz to 862 MHz		
Operating	4 nW /-54dBm	250 nW/-36dBm	1 μW /-30dBm
Standby	2 nW /-57dBm	2 nW /-57dBm	20 nW /-47dBm

#### 8.2 Measuring Instruments and Setting

The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier frequency
Detector	Positive Peak
Sweep Time	Auto A A A A A A A
RB / VB	1 MHz / 1 MHz

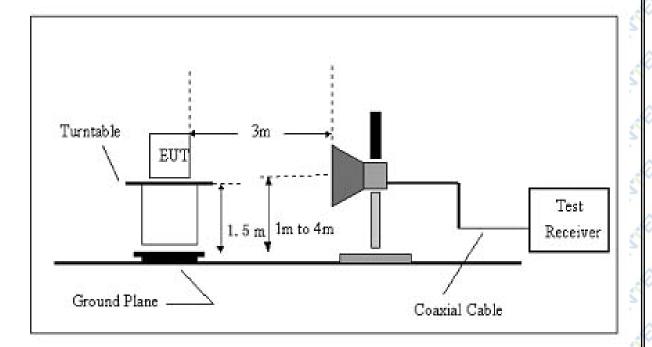


#### 8.3 Test Procedures

- a. The EUT was placed on the top of the turntable in open test site area.
- b. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- c. This measurement shall be repeated with the transmitter in standby mode where applicable.
- d. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
- e. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
- f. Replace the EUT by standard antenna and feed the RF port by signal generator.
- g. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
- h. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
- i. The level of the spurious emission is the power level of (8) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
- j. If the level calculated in (9) is higher than limit by more than 6dB, then lower the RBW of the spectrum analyzer to 30KHz. If the level of this emission does not change by more than 2dB, then it is taken as narrowband emission, otherwise, wideband emission.
- k. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

#### 8.4 Test Setup Layout

(B) Radiated Emission Test Set-Up Frequency Above 1 GHz







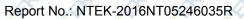
Report No.: NTEK-2016NT05246035R

	8	.5	Eι	JT.	Op	eration	n during	Test
--	---	----	----	-----	----	---------	----------	------

The EUT was programmed to be in continuously transmitting mode.

8.6 Results of Standby Mode Spurious Emissions

For the initial investigation on standby mode and receiving mode, no significant differences in spurious emissions were observed between these mode. So test data for standby mode was omitted in this section.





#### 8.7 TEST RESULTS

EUT:	Ajax MotionProtect	Model Name :	Ajax MotionProtect
Temperature :	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage :	DC 3.0V
Test Mode :	TX O	4 4 4	0, 0, 0

Polar	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(H/V)	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	Туре
V	1741.58	60.44	3.14	-35.63	-30.00	-5.63	peak
V	2622.83	40.31	9.27	-36.31	-30.00	-6.31	peak
V	3474.71	58.54	8.61	-44.95	-30.00	-14.95	peak
V	9496.58	39.39	14.83	-43.10	-30.00	-13.10	peak
H	1741.58	58.51	3.45	-39.56	-30.00	-9.56	peak
44	2681.58	35.61	-5.17	-44.96	-30.00	-14.96	peak
H	4150.33	62.26	-10.82	-46.72	-30.00	-16.72	peak
H	10789.08	44.51	-10.82	-39.51	-30.00	-9.5 <mark>1</mark>	peak

#### Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



#### 9. Duty cycle

#### 9.1 Applied procedures / limit

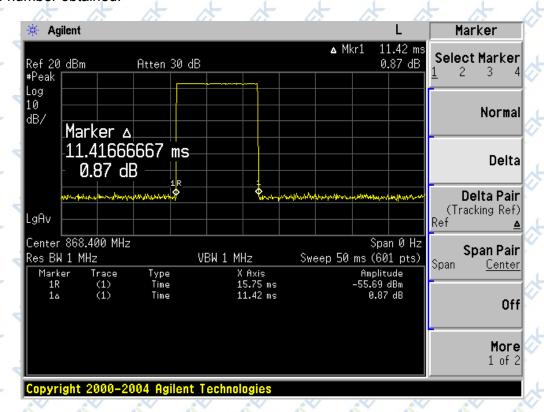
In a period of 1 hour the duty cycle shall not exceed 1%

#### 9.2 TEST RESULTS

Test Result

Duty Cycle	Limit	Result		
≤ 1% <sub>Note</sub>	1%	Complies		

Note: The result is that the customer claims that its prototype emission per hour less than 3152 times the number obtained.



Report No.: NTEK-2016NT05246035R



10. Transient power

#### 10.1 Applied procedures / limit

At all frequencies where the emission levels measured in step 1 exceed the spurious domain limits (clause 7.8.3), the power level measured in step 1 shall not exceed the power level measured in Step 2 by more than 3 dB.

#### 10.2 Test Procedures

#### Step 1

The transmitter shall be operated with powering on and off (e.g. by switching between active and standby state) at least 5 times within a maximum period of 60 seconds. The recommended powering on- and off-time is at least 1 s respectively. If other on- and off-times are used, this shall be stated in th test report.

The measured power level shall be recorded for the measurement period covering at least 5 powering on and off events for the measurement receiver setting above and below the wanted channel.

If the resulting maximum power level in step 1 is above the spurious domain limit (clause 7.8.3), the second measurement step shall be performed.

#### Step 2

In the second measurement, the procedure shall be repeated with the same settings of the measuring receiver, whereas

the transmitter shall be set on continuous transmission. If this is not possible, the measurements shall be carried out in a period shorter than the duration of the modulated transmitted burst.

The measured power level shall be recorded for the measurement period identical to the one in step 1 for the measurement receiver setting above and below the wanted channel.

Measurement step 1 shall be repeated within the spectrum mask every 120 kHz from the primarily adjusted point to both sides of the wanted frequencies, until either it is clearly ascertained that no power increases or limit exceeding appear, or until the frequency offset to the wanted frequency exceeds 2 MHz.

#### 10.3 Test Result





Temperature:

Report No.: NTEK-2016NT05246035R Ajax MotionProtect Model Name : Relative Humidity: 53 %

Pressure: 1012 hPa Test Voltage :

26°C

Ajax MotionProtect

DC 3.0V

Test Mode : TX CH0

#### FΑ

EUT:

	Channel Spacing	Step 1	Step 2	△(Step 1-Step2)	Limit	Results
(	(times)	(dBm)	(dBm)	dB	dB	(P/F)
	1(+100kHz)	4.181	4.364	-0.183	3 4	PASS
	2(+120kHz)	+ 0+ 0+	d1 d	414	3	PASS

<	Channel Spacing	Step 1	Step 2	△(Step 1-Step2)	Limit	Results
/	(times)	(dBm)	(dBm)	dB	dB	(P/F)
<b>\</b>	1(+100kHz)	-27.56	-28.50	0.94	3	PASS
	2(+120kHz)	-37.35	-39.27	1.92	3	PASS
	3(+240kHz)	191 19	101	1 1	ALC: N	PASS
	4(+360kHz)	7 1 7	7 7	F	4 4	PASS
_						

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11. Adjacent channel power

#### 11.1 Applied procedures / limit

These measurements are applicable to narrowband systems.

#### Adjacent channel power limits applicable to narrowband systems

+	Channel separation < 20 kHz	Channel separation ≥ 20 kHz				
Normal test conditions	10 μW	200 nW				
Extreme test conditions	32 μW	640 nW				
NOTE: These limits also apply to spread spectrum equipment.						

#### 11.2 Test Procedures

a) The transmitter shall be operated at the carrier power determined under normal test conditions.

The output of the transmitter shall be linked to the input of the "receiver" by a connecting device such that the impedancepresented to the transmitter is 50  $\,\Omega$  and the level at the "receiver input" is appropriate

- b) With the transmitter unmodulated, the tuning of the "receiver" shall be adjusted so that a maximum response is obtained. This is the 0 dB response point. The "receiver" attenuator setting and the reading of the meter shall be recorded. If an unmodulated carrier cannot be obtained, then the measurement shall be made with the transmitter modulated with the normal test signal as appropriate, in which case this fact shall be recorded in test reports.
- c) The transmitter shall be modulated by a normal test signal as appropriate.
- d) The "receiver" variable attenuator shall be adjusted to obtain the same meter reading as in step b), or a known relation to it.
- e) The ratio of the adjacent channel power to the carrier power is the difference between the attenuator settings in steps b) and d), corrected for any differences in the reading of the meter.

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11.3 Test Result

EUT:	Ajax MotionProtect	1	Model Name :	Ajax MotionProtect	
Temperature :	26°C		Relative Humidity:	53 %	
Pressure :	1012 hPa		Test Voltage :	N/A	
Test Mode :	N/A — —	2	4, 4,	4, 4, 4,	

#### 12. Modulation bandwidth

#### 12.1 Applied procedures / limit

**Emission Limits of the modulated signal** 

Reference Bandwidth (RBW)	Limit	Lower envelope point minimum frequency	Upper envelope point maximum frequency	
1 kHz	1 uW	fe, lower	fe, upper	
1 kHz	250 nW	(fe, lower - 200 kHz)	(fe, upper + 200 kHz)	
10 kHz	250 nW	(fe, lower - 400 kHz)	(fe, upper + 400 kHz)	
100 kHz	250 nW	(fe, lower - 1 000 kHz)	(fe, upper + 1000kHz)	

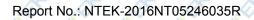
In table, fe,lower and fe,upper are the lower and upper edges of the band in which the equipment operates.

#### 12.2 Measuring Instruments and Setting

Spectrum Analyzer	Setting
Attenuation	Auto
Detector	Positive Peak
Sweep Time	Auto
RB	1KHZ, 10KHz, 100KHz
VB 🕠	3RB

12.3 Test Procedures In clauses 7.2 or 7.3

12.4 Test Result





EUT:	Ajax MotionProtect	1	Model Name :	Ajax MotionProtect
Temperature :	26°C		Relative Humidity:	53 %
Pressure :	1012 hPa		Test Voltage :	DC 3.0V
Test Mode :	TX CH0	2	4 4	7, 7, 7, 4

# Test Conditions : TNVN

Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, upper + 200 kHz)	-32.37	-30dBm	1KHz	PASS
(fe, upper + 400 kHz)	-50.28	-36dBm	10KHz	PASS
(fe, upper + 1 000 kHz)	-49.64	-36dBm	100KHz	PASS
> (fe, upper + 1 000 kHz)	-46.58	-36dBm	100KHz	PASS

 Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, lower - 200 kHz)	-32.58	-30dBm	1KHz	PASS
(fe, lower - 400 kHz)	-51.44	-36dBm	10KHz	PASS
(fe, lower - 1 000 kHz)	-50.62	-36dBm	100KHz	PASS
< (fe, lower - 1 000 kHz)	-47.71	-36dBm	100KHz	PASS

#### THVH

Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, upper + 200 kHz)	-32.64	-30dBm	1KHz	PASS
(fe, upper + 400 kHz)	-52.82	-36dBm	10KHz	PASS
(fe, upper + 1 000 kHz)	-49.55	-36dBm	100KHz	PASS
> (fe, upper + 1 000 kHz)	-46.16	-36dBm	100KHz	PASS



Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, lower - 200 kHz)	-32.43	-30dBm	1KHz	PASS
(fe, lower - 400 kHz)	-51.52	-36dBm	10KHz	PASS
(fe, lower - 1 000 kHz)	-50.78	-36dBm	100KHz	PASS
< (fe, lower - 1 000 kHz)	-46.49	-36dBm	100KHz	PASS

47	(le, lower 1 000 Ki iz)	7-03	-JOGDIII	TOURTIZ	47 4
TLV		4 4	4" 4"	4 4	4 4
	Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
	(fe, upper + 200 kHz)	-32.17	-30dBm	1KHz	PASS
4	(fe, upper + 400 kHz)	-52.64	-36dBm	10KHz	PASS
	(fe, upper + 1 000 kHz)	-49.72	-36dBm	100KHz	PASS
d	> (fe, upper + 1 000 kHz)	-46.48	-36dBm	100KHz	PASS

Lower envelope point	Max Vaule (dBm)	Limit	Reference Bandwidth	Result
	(dbiii)	X X	(RBW)	A /
(fe, lower - 200 kHz)	-32.55	-30dBm	1KHz	PASS
(fe, lower - 400 kHz)	-51.34	-36dBm	10KHz	PASS
(fe, lower - 1 000 kHz)	-50.72	-36dBm	100KHz	PASS
< (fe, lower - 1 000 kHz)	-46.51	-36dBm	100KHz	PASS

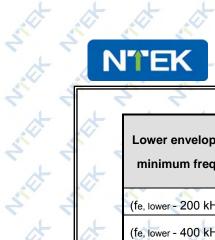
#### THVL

Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, upper + 200 kHz)	-32.68	-30dBm	1KHz	PASS
(fe, upper + 400 kHz)	-52.59	-36dBm	10KHz	PASS
(fe, upper + 1 000 kHz)	-49.45	-36dBm	100KHz	PASS
> (fe, upper + 1 000 kHz)	-47.36	-36dBm	100KHz	PASS

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Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result	
(fe, lower - 200 kHz)	-33.25	-30dBm	1KHz	PASS	3
(fe, lower - 400 kHz)	-51.54	-36dBm	10KHz	PASS	t it
(fe, lower - 1 000 kHz)	-50.66	-36dBm	100KHz	PASS	3
< (fe, lower - 1 000 kHz)	-47.48	-36dBm	100KHz	PASS	t x
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	4	Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
1	4	(fe, upper + 200 kHz)	-32.75	-30dBm	1KHz	PASS
4		(fe, upper + 400 kHz)	-52.77	-36dBm	10KHz	PASS
4	4	(fe, upper + 1 000 kHz)	-49.43	-36dBm	100KHz	PASS
W S	Ø,	> (fe, upper + 1 000 kHz)	-47.61	-36dBm	100KHz	PASS
*	*				Reference	

A STATE OF THE PARTY OF THE PAR	村	Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result		
4	· <	(fe, lower - 200 kHz)	-33.88	-30dBm	1KHz	PASS	4	4
		(fe, lower - 400 kHz)	-51.08	-36dBm	10KHz	PASS	<b>!</b>	et «
4 4	-	(fe, lower - 1 000 kHz)	-51.49	-36dBm	100KHz	PASS	4	-
.01	O.	< (fe, lower - 1 000 kHz)	-48.38	-36dBm	100KHz	PASS	<u>+</u>	ot a
4	5	4 4	4	4 4	4 4	4 4	4	7
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#### 13 Receiver sensitivity

#### 13.1 Limit

Under normal test conditions, the value of the maximum usable sensitivity for a 25 kHz channel spacing equipment with a 16 kHz bandwidth shall not exceed +6 dBμV emf for a 50 Ω receiver input impedance. This corresponds to a receiver sensitivity of -107 dBm which shall not be exceeded. The limit for usable sensitivity for other receiver bandwidths than 16 kHz is given by:

$$S = +6 + 10\log \frac{BW}{16} dB\mu V emf$$
  
 $S_F = 10\log \frac{BW}{16} - 107 dBm$ 

#### where

- S is the sensitivity in dBµV emf;
- S<sub>P</sub> is the sensitivity in dBm;
- BW is the receiver bandwidth in kHz. The receiver bandwidth is a declaration by the manufacturer.

declaration shall be stated in the test report.

#### 13.2 Method of measurement with continuous bit streams

The method please refer to the standard ETSI EN 300 220-1 V2.4.1: 2012-05 clause 8.1.2.

#### 13.3 Method of measurement with messages

The method please refer to the standard ETSI EN 300 220-1 V2.4.1: 2012-05 clause 8.1.3.



#### 14. Blocking

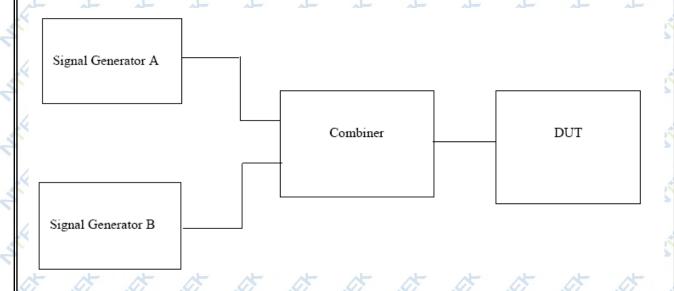
#### 14.1 Applied procedures / limit

Receiver category	Frequency offset	Limit
	±2 MHz	≥84 dB -A (note 2)
2 2 2 2	±2 MHz	≥35 dB -A (note 2)
3	±2 MHz	≥24 dB -A (note 2)
4 4 1 4 4	±10 MHz	≥84 dB -A (note 2)
C (2	±10 MHz	≥60 dB -A (note 2)
2 2 3 2 2	±10 MHz	≥44 dB -A (note 2)

NOTE 1: The limits apply also for the repeated tests in case of equipment using LBT or category 1 receivers, reduced by 13 dB or 40 dB, respectively, to account for the increased wanted signal level.

NOTE 2: A = 10 log (BWkHz / 16 kHz) BW is the receiver bandwidth.

#### 14.2 Method of measurement



#### 14.3 Test Procedures In clauses EN 300 220-1 8.4.2

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#### 14.4 Test Result:

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	l.4 Test Result: Receiver bandwidth	n=788.55KHz	at Ariat Ariat	7.0t 7.0t 7.0t 7.
2	EUT:	Ajax MotionProtect	Model Name :	Ajax MotionProtect
	Temperature :	26°C	Relative Humidity:	53 %
	Pressure :	1012 hPa	Test Voltage :	DC 3.0V
4	Test Mode :	RX V V		

Receiver category	Frequency	Reciever BW(kHz)	Measurement Vause(dB)	Limit(dB)
	-2 MHz	788.55	21.57	7.07
4	+2 MHz	788.55	23.11	7.07
3	-10 MHz	788.55	34.42	27.07
4	-10 MHz	788.55	36.69	27.07

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#### 15. Spurious emissions - Receiver (30-1000MHz)

#### 15.1 Applied procedures / limit

Clause	Test Item	Frequency(MHz)	Limit	
125	Spurious emissions	25-1000	-57dBm	
4.3.5	(radiated)	Above 1000	-47dBm	

#### 15.2 Measuring Instruments and Setting

The following table is the setting of the Spectrum Analyzer.

The following table is the setting	ig of the opeotrality that yeer:
Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	25 MHz
Stop Frequency	1000 MHz
Detector	Positive Peak
Sweep Time	Auto
RB / VB	100 kHz/100 kHz

#### 15.3 Test Procedures

- a. The EUT was placed on the top of the turntable in open test site area.
- b. The test shall be made in the receiving mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- c. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
- d. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
- e. Replace the EUT by standard antenna and feed the RF port by signal generator.
- f. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
- g. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
- h. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
- The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

#### 15.4 Test Setup Layout

This test setup layout is the same as that shown in section 5.1.3

#### 15.5 EUT Operation during Test

The EUT was programmed to be in continuously receiving mode.





#### 15.6 TEST RESULTS (25MHz-1000MHz)

EUT:	Ajax MotionProtect	Model Name :	Ajax MotionProtect
Temperature :	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage :	DC 3.0V
Test Mode :	RX of of	* * *	0 0 0

Polar	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(H/V)	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	Туре
V	41.97	60.44	17.31	-76.54	-57.00	-19.54	peak
V	179.81	40.31	12.42	-80.58	-57.00	-23.58	peak
V	336.25	58.54	13.60	-70.76	-57.00	-13.76	peak
H	44.49	39.39	16.17	-74.80	-57.00	-17.80	peak
Н	340.89	58.51	13.75	-71.30	-57.00	-14.30	peak
H	395.20	35.61	-5.17	-72.10	-57.00	-15.10	peak

#### Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit





#### 16. Spurious emissions – Receiver (above 1000MHz)

#### 16.1 Applied procedures / limit

Clause	Test Item	Frequency(MHz)	Limit	
4.3.5	Spurious emissions	25-1000	-57dBm	
4.3.3	(narrowband)	Above 1000	-47dBm	

#### 16.2 Measuring Instruments and Setting

Please refer to section 9.1.1 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	12750 MHz
Detector	Positive Peak
Sweep Time	Auto
RB / VB	1MHz / 1MHz

#### 16.3 Test Procedures

- a. The EUT was placed on the top of the turntable in open test site area.
- b. The test shall be made in the receiving mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- c. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
- d. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
- e. Replace the EUT by standard antenna and feed the RF port by signal generator.
- f. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
- g. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
- h. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
- The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

#### 16.4 Test Setup Layout

This test setup layout is the same as that shown in section 6.1.3

#### 16.5 EUT Operation during Test

The EUT was programmed to be in continuously receiving mode.

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## 16.6 TEST RESULTS (Above 1000MHz)

16.6 TEST RESU	JLTS (Above 1000MHz	2)0+	t Tet I	at the	t Test	
EUT:	Ajax MotionProtect	1	Model Name :	Ajax I	MotionPro	tect
Temperature :	26°C	AF	Relative Humidi	ity: 53 %	- 47	4
Pressure:	1012 hPa	2 7	Test Voltage :	DC 3	.0V	7 5
Test Mode :	RX +	* ^	+ +	* ^	t 4	+
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Polar	Frequency	Reading	Factor	Level	Limits	Margin	Detector			
	(H/V)	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	Туре		
1	V	2976.54	60.44	8.96	-52.61	-47.00	-5.61	peak		
	V	6442.79	40.31	12.99	-51.73	-47.00	-4.73	peak		
1	V	8469.67	58.54	15.69	-50.19	-47.00	-3.19	peak		
	V	10349.67	39.39	16.44	-50.14	-47.00	-3.14	peak		
	H	2829.67	58.51	8.71	-53.98	-47.00	-6.98	peak		
ŧ-	Н	6619.04	35.61	-5.17	-52.44	-47.00	-5.44	peak		
-	H	7970.29 10790.29	62.26 44.51	-10.82 -10.82	-51.30 -50.01	-47.00 -47.00	-4.30 -3.01	peak peak		
	4							peak		
F	Remark: Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit									
	41									
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